* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The light source, the half mirror which divides the light of this light source into the transmitted light and the reflected light, and the 1st space modulation element which modulates said transmitted light and forms the pattern light of the mirror image of the 1st parallax image, this -- carry out reflective condensing of the pattern light of the mirror image of the 1st parallax image, and pass reflection of a half mirror -- with the 1st reflective condensing means led to the observation zone corresponding to one eye of an observer the 2nd space modulation element which modulates said reflected light and forms the pattern light of the 2nd parallax image -- this -- carry out reflective condensing of the pattern light of the 2nd parallax image, and pass transparency of a half mirror -- the solid image display device characterized by having the 2nd reflective condensing means led to the observation zone corresponding to the eye of an observer's another side.
[Claim 2] in claim 1, the optical axis of said 1st reflective condensing means reflected by the half mirror and the optical axis of the 2nd reflective condensing means which passes a half mirror are not in agreement -- as -- this -- the solid image display device characterized by arranging the 1st reflective condensing means and the 2nd reflective condensing means.
[Claim 3] It is the solid image display device which said light source has the light-emitting part which emits 2nd at least one different polarization from the light-emitting part which emits 1st at least one polarization, and this polarization in claim 1, and said 1st space modulation element has the polarizing plate which can pass only polarization of one side of said the 1st and 2nd polarization, and is characterized by for said 2nd space modulation element to have the polarizing plate which can pass only polarization of another side.
[Claim 4] It is the solid image display device which sets they to be [any of claim 1 thru/or claim 3], and is characterized by said reflective condensing means having a condenser lens and a plane mirror.
[Claim 5] It is the solid image display device which sets they to be [any of claim 1 thru/or claim 3], and is characterized by said reflective condensing means having two or more small concave mirrors arranged in the shape of a field.
[Claim 6] It is the solid image display device characterized by setting they being [any of claim 1 thru/or claim 5], and said light source having two or more smallness light-emitting part arranged in the shape of a field.
[Claim 7] It is the solid image display device which said two or more smallness light-emitting part carries out sequential luminescence, and is characterized by said 1st and 2nd space modulation elements carrying out sequential formation of the mirror image pattern light of said parallax image of a direction which is different according to the location of the small light-emitting part under luminescence, respectively, and said parallax image pattern light, respectively in claim 6.
[Claim 8] The solid image display device characterized by having an observer's location detection equipment, choosing at least one small light-emitting part, and making it emit light from said two or more smallness light-emitting part in claim 6 based on the detection information on this detection equipment.

[Claim 9] It is the solid image display device characterized by for said 1st space modulation element forming the pattern light of the mirror image of the parallax image according to the location of one eye of the observer who detected with said detection equipment in claim 8, and said 2nd space modulation element forming the pattern light of the parallax image according to the location of the eye of another side of the observer who detected with said detection equipment.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the compact glasses-less solid image display device which can respond to two or more observers.
[0002]
[The technical problem which a background technique and invention make solution ******] Although the lenticular method and the parallax method are well learned as a solid display which does not use glasses, when resolution is low, there is a problem which cannot respond to migration of an observer easily.
[0003] as the method which can solve these problems -- "J. -- R.Moore, N.A.Dodgson, A.R.L.Travis, S.R.Lang, Time multiplexed color autostereoscopic display, and Proc. There is time-division system which is stated to SPIE.2653-01." As shown in drawing 11 , this carries out image formation of the parallax image displayed on a high speed CRT 901 with the lens 904 which approached the liquid crystal shutter array 902, and arranges Fresnel lens 903 to an image formation side. If the parallax image with which image formation is carried out with Fresnel lens 903, two or more observation zones 905 are formed in the image formation location, and the liquid crystal shutter arrays 902 differ corresponding to sequential closing motion of the liquid crystal shutter array 902 is displayed on a high speed CRT 901, an observer can see a solid image, moving using two or more observation zones 905. However, in order that this method may show the parallax image which carried out image formation with the lens 904, it is difficult to be influenced by lens distortion and to obtain a high quality stereoscopic model.
[0004] Many things which used the liquid crystal panel instead of image formation are also proposed. If this kind of solid display ****, there is an approach indicated by JP,7-159723,A. As shown in drawing 12 , using the transparency mold liquid crystal panel 911 and the 2D display 912 used as the back light light source 2 sets, this illuminates an observer's half-face with an infrared lamp 915, and photos it with the infrared camera 916. If the image which according to this approach displayed the parallax image on either side on each transparency mold liquid crystal panel 911, and carried out the reverse of that color to monochrome image of the observer photoed is displayed on each 2D display 912, a stereoscopic model can be seen while two or more observers move.
[0005] moreover, the approach indicated by JP,9-236880,A is shown in drawing 13 -- as -- the transparency mold liquid crystal panel 921, the back light light source 922, and Fresnel lens 923 -- although 2 sets and a half mirror 924 are used, since the parallax image corresponding to the location of the observer who detected with detection equipment 925 is displayed, the display of the stereoscopic vision accompanying motion parallax is possible.
[0006] although there is almost no distortion of an image in order that an observer may observe the liquid crystal panel close to a Fresnel lens, two liquid crystal panels need the respectively independent back light light source, and the volume of a system becomes large by using the two back light light sources, since it is necessary to separate and to establish the back light light source from a liquid crystal panel, and it comes to be alike of costs by these approaches highly

[0007] The solid display indicated by JP,9-149433,A is one of those set the two back light light sources to one. As shown in drawing 14 , this reflects the back light optical path of two liquid crystal panels 931 with a reflecting mirror 936, respectively, and is compounded by the half mirror 934. However, this approach cannot make the volume of a system small.
[0008] Moreover, in JP,8-160354,A, the **** thing is indicated for one back light and the liquid crystal panel which has two kinds of one polarization pixel. This arranges two kinds of polarization pixels 951 and 961 corresponding to the polarization light sources 952 and 962 which are different in one liquid crystal panel 941, respectively, as shown in drawing 15 . If it is made to carry out incidence of the polarization light sources 952 and 962 to an eye on either side, the parallax image of the right and left displayed on the polarization pixels 951 and 961 can go into an eye on either side, respectively. Although this system is compact, in order to divide the pixel of one liquid crystal panel and to display two parallax images, the image quality of the stereoscopic model displayed will be halved.
[0009] This invention solves the conventional technical problem mentioned above, and aims at offering the solid image display device in which cheapness, high definition, and two or more observer correspondence of a compact are possible.
[0010]
[Means for Solving the Problem] The half mirror which will divide the light of the light source and this light source into the transmitted light and the reflected light if the solid image display device of this invention is caused like 1 voice, The 1st space modulation element which modulates said transmitted light and forms the pattern light of the mirror image of the 1st parallax image, this -- carry out reflective condensing of the pattern light of the mirror image of the 1st parallax image, and pass reflection of a half mirror -- with the 1st reflective condensing means led to the observation zone corresponding to one eye of an observer the 2nd space modulation element which modulates said reflected light and forms the pattern light of the 2nd parallax image -- this -- carry out reflective condensing of the pattern light of the 2nd parallax image, and pass transparency of a half mirror -- it is characterized by having the 2nd reflective condensing means led to the observation zone corresponding to the eye of an observer's another side.
[0011] When displaying a stereoscopic model based on the parallax image of the right-and-left both eyes formed of two space modulation elements according to this invention, reflective condensing of the pattern light which could irradiate two space modulation elements by the one light source by using a half mirror and two reflective condensing means, and was formed by each space modulation element can be carried out in a different observation zone. Stereoscopic vision is possible if a right-and-left eye is put on this different observation sone, respectively. The whole equipment is compact, having a space modulation element independent of an eye on either side, and being able to display a high-definition stereoscopic model, since the one light source irradiates two space modulation elements and carries out reflective condensing at an eye on either side.
[0012] Here, a space modulation element can be used as a transparency mold liquid crystal panel, a reflective mold liquid crystal panel, etc. Moreover, as for the transparency mold liquid crystal panel and reflective mold liquid crystal panel which are used here, it is desirable not to have the means, for example, a diffusion filter, a diffuse reflection electrode, etc., for carrying out visual field expansion etc.
[0013] When a space modulation element is a transparency mold liquid crystal panel, a reflective condensing means can have a condenser lens and a flat-surface reflective mirror. It is more desirable to have prepared the condenser lens in front of the liquid crystal panel, and to prepare [it was / a flat-surface reflective mirror / close, and] it after a liquid crystal panel, in order to prevent a twin image. When a space modulation element is a reflective mold liquid crystal panel, a reflective condensing means can be used as the reflecting plate inside the back substrate of a condenser lens and a reflective mold liquid crystal panel. In this case, a reflecting plate may be a reflector.
[0014] As for a condenser lens, it is desirable that it is a Fresnel lens because of weight mitigation. In this case, it is more desirable to have carried out the processing side of a Fresnel lens outward, and to stick a non-processed side (flat surface) on a liquid crystal panel, in order to prevent surface reflection. ****** processing may be performed to a condenser lens front face.

[0015] Furthermore, you may be the array of the small concave mirror which has the same focus which is close after a liquid crystal panel as a reflective condensing means. In order to prevent a twin image, as for the reflector of a smallness concave mirror, it is desirable that it is inside the back substrate of a liquid crystal panel. A small concave mirror may be the reflector of the reflective mold liquid crystal panel formed in a concave surface.
[0016] The light source which can offer two or more light-emitting parts, such as the light source which has single light-emitting parts, such as a fluorescent lamp, an electric bulb, and LED, as the light source or an array, 2D display, for example, an LED array, monochrome liquid crystal display, and CRT, can be used. If two or more pixels are shone when 2D display is used as the light source, it can function as one light-emitting part.
[0017] in this invention, the optical axis of said 1st reflective condensing means reflected by the half mirror and the optical axis of the 2nd reflective condensing means which passes a half mirror are not in agreement -- as -- this -- the 1st reflective condensing means and the 2nd reflective condensing means can be arranged.
[0018] For example, if the direction of the optical axis of the 1st reflective condensing means reflected by the half mirror and the direction of the optical axis of the 2nd reflective condensing means which passes a half mirror are shifted and the 1st reflective condensing means and the 2nd reflective condensing means are arranged, the light of one light-emitting part can carry out reflective condensing through a half mirror to the location which changes with the 1st reflective condensing means and 2nd reflective condensing means.
[0019] Moreover, if the location of the optical axis of the 1st reflective condensing means reflected by the half mirror and the location of the optical axis of the 2nd reflective condensing means which passes a half mirror are horizontal ****** carried out for example, and the 1st reflective condensing means and the 2nd reflective condensing means are arranged, the light of one light-emitting part can carry out reflective condensing through a half mirror to the location which changes with the 1st reflective condensing means and 2nd reflective condensing means.
[0020] If an observer puts an eye on either side on a location different the account of a top in order to carry out reflective condensing in a location which the light of one light-emitting part is modulated by parallax image pattern light on either side by two space modulation elements, and is different in these cases, respectively, a parallax image pattern light on either side will enter, respectively, and stereoscopic vision will be materialized. Since a parallax image pattern light on either side can be offered with one light-emitting part, a cheap and simple system becomes possible.
[0021] Moreover, in this invention, said light source can have the light-emitting part which emits 2nd at least one different polarization from the light-emitting part which emits 1st at least one polarization, and this polarization, said 1st space modulation element can have the polarizing plate which can pass only polarization of one side of said the 1st and 2nd polarization, and said 2nd space modulation element can have the polarizing plate which can pass only polarization of another side.
[0022] Since the light source has the polarization light-emitting part pair which emits light in at least one different polarization and two space modulation elements have the polarizing plate of a different transparency shaft, two space modulation elements modulate only the polarization from a different polarization light-emitting part which passes a different polarizing plate, respectively, and form a parallax image pattern light on either side. If a different polarization light-emitting part is justified so that it may condense through a half mirror to the eye of right and left of the observer in the location which changes with two reflective condensing means, a parallax image pattern light on either side will go into an eye on either side, and stereoscopic vision will be materialized. In this case, what is necessary is just to adjust the location of a polarization light-emitting part, in order to make the eye of two right and left condense the polarization from which two polarization light-emitting parts differ, respectively. It is an advantage for justification of a light-emitting part to be easier than justification of a reflective condensing means or a half mirror. If it considers as the light source which has two different polarization light-emitting parts, a polarizing plate which is different in each light-emitting part can be attached and used. Moreover, monochrome liquid crystal display which has only one polarizing plate, for example

can be used. Although one polarization is emitted from a screen when there is no output signal, when outputting, the polarization from which only the screen of the output section differs is emitted, and two different polarization light-emitting parts are formed.

[0023] In this invention, if two or more light-emitting parts (or two or more polarization light-emitting part pairs) are made to emit light in order to form the observation zone of the stereoscopic vision of one pair with one light-emitting part (or 1 polarization light-emitting part pair), the observation zone of the stereoscopic vision of two or more pairs can be offered, and it can respond to two or more observers. Moreover, arrange two or more light-emitting parts (or two or more polarization light-emitting part pairs) in a longitudinal direction, and sequential luminescence is carried out at high speed. If the 1st space modulation element and the 2nd space modulation element modulate the mirror image of a parallax image and parallax image corresponding to the light-emitting part which emits light, respectively and high-speed formation is carried out The observation zone pair of the stereoscopic vision of continuation is formed in a longitudinal direction location by time sharing, and while an observer moves according to the after-image phenomenon of an eye, the three dimensional image of continuation can be seen.

[0024] Moreover, the detection equipment which detects an observer's location is formed, and what can offer the observation zone corresponding to an observer's location can be chosen, and can be made to emit light from two or more light-emitting parts (or two or more polarization light-emitting part pairs). Since it will be followed and a light source location will be changed even if an observer moves if it carries out like this, incidence of the mirror image pattern light of a parallax image and parallax image pattern light which are formed of two space modulation elements is always separately carried out to an observer's both eyes. The three dimentional display which follows an observation location becomes possible. Moreover, if the reflected image pattern light of the parallax image of an observation zone according to the current position of the observer who detects in this case, and parallax image pattern light are formed, it will become possible for an observer to turn and to see the three dimensional image of continuation.

[0025] Although the detection equipment which detects an observer's location can use location detection equipments, such as a camera and a magnetic position sensor, here, it is desirable to use the infrared camera which photos the infrared light source which irradiates an observer, and an observer.

[0026] As for the space modulation element by the side of reflection, in the equipment described above, it is desirable to make both sides reverse and to prepare them. If it carries out like this, and a parallax picture signal is outputted, the mirror image of the parallax image of the need can be acquired to this solid image display device.

[0027]

[Embodiment of the Invention] Drawing 1 is the explanatory view showing 1 operation gestalt of this invention. The three dimentional display equipment for displaying the parallax image of right eye correspondence in an observer's right eye 10 and the parallax image of left eye correspondence in a left eye 11, respectively is illustrated by drawing 1 . In drawing 1 , it has the fluorescent lamp 21 which has, a half mirror 30, and the light source 20, for example, a light-emitting part, the 1st space modulation element 40, for example, a liquid crystal panel, the 2nd space modulation element 41, for example, a liquid crystal panel, the 1st reflective condensing means, for example, Fresnel lens 50 and the flat-surface mirror 52, the 2nd reflective condensing means 51, for example, a Fresnel lens, and the flat-surface mirror 53.

[0028] Drawing 2 is the top view of drawing 1 . With a half mirror 30, the light of the light-emitting part 20 of a fluorescent lamp 21 is divided into the transmitted light 70 and the reflected light 71, and irradiates liquid crystal panels 40 and 41 from a transverse plane, respectively. A liquid crystal panel 40 modulates the transmitted light 70, and forms the reflected image pattern light 72 of an observer's parallax image for right eyes. A liquid crystal panel 41 modulates the reflected light 71, and forms an observer's parallax image pattern light 73 for left eyes. With this operation gestalt, it is close behind liquid crystal panels 40 and 41, the flat-surface reflective mirrors 52 and 53 are formed, respectively, and Fresnel lenses 50 and 51 are formed in front, respectively.

[0029] The optical axis 500 (white line) of the 1st reflective condensing means which consists of Fresnel lens 50 reflected by the half mirror 30 and a flat-surface mirror 52 is inclined to right-hand side. By making it incline to left-hand side, the optical axis 510 (white line) of the 2nd reflective condensing means which consists of Fresnel lens 51 which passes a half mirror 30, and a flat-surface mirror 53 The parallax image pattern light 73 for left eyes which formed in the right-hand side observation zone the parallax image pattern light 72 for right eyes formed with the liquid crystal panel 40 with the liquid crystal panel 40 can be condensed in a left-hand side observation zone, respectively, and an observer can see [in / for an eye on either side / each correspondence observation zone] a stereoscopic model.
[0030] In this example, although the Fresnel lens, the liquid crystal panel, and the flat-surface reflective mirror are parallel, they do not surely need to be parallel. Even when only a flat-surface reflective mirror inclines, the optical axis of a reflective condensing means inclines. However, it is more desirable to have been parallel and close and to prepare a liquid crystal panel in a flat-surface reflective mirror for twin image prevention. Moreover, although the inclination direction of the optical axis of the 1st and 2nd reflective condensing means is illustrated, the inclination direction of an optical axis is not restricted to this, either. For example, the optical axis 500 (white line) of the 1st reflective condensing means which consists of Fresnel lens 50 reflected by the half mirror 30 and a flat-surface mirror 52 is inclined to left-hand side. When making the optical axis 510 (white line) of the 2nd reflective condensing means which consists of Fresnel lens 51 which passes a half mirror 30, and a flat-surface mirror 53 incline to right-hand side, If a liquid crystal panel 40 forms the reflected image pattern light 72 of an observer's parallax image for left eyes and a liquid crystal panel 41 forms an observer's parallax image pattern light for right eyes. Stereoscopic vision is possible similarly.
[0031] Drawing 3 is the modification of the gestalt of operation of drawing 2 . The difference from the gestalt of operation and the gestalt of operation of drawing 2 which are shown in drawing 3 is having shifted the not a direction but location of an optical axis. The location of the optical axis 500 (white line) of the 1st reflective condensing means which consists of Fresnel lens 50 reflected by the half mirror 30 and a flat-surface mirror 52 is located in right-hand side. When making it the location of the optical axis 510 (white line) of the 2nd reflective condensing means which consists of Fresnel lens 51 which passes a half mirror 30, and a flat-surface mirror 53 located in left-hand side The parallax image pattern light 73 for left eyes which formed in the right-hand side observation zone the parallax image pattern light 72 for right eyes formed with the liquid crystal panel 40 with the liquid crystal panel 40 can be condensed in a left-hand side observation zone, respectively, and an observer can see [in / for an eye on either side / each correspondence observation zone] a stereoscopic model.
[0032] In this example, although the relative position of the optical axis of the 1st and 2nd reflective condensing means is illustrated, the relative position of an optical axis is not restricted to this. For example, the optical axis 500 (white line) of the 1st reflective condensing means which consists of Fresnel lens 50 reflected by the half mirror 30 and a flat-surface mirror 52 is located in the left. Even if it makes it located in right-hand side, the optical axis 510 (white line) of the 2nd reflective condensing means which consists of Fresnel lens 51 which passes a half mirror 30, and a flat-surface mirror 53 If a liquid crystal panel 40 forms the reflected image pattern light 72 of an observer's parallax image for left eyes and a liquid crystal panel 41 forms an observer's parallax image pattern light for right eyes. Stereoscopic vision is possible similarly.
[0033] Drawing 4 (drawing 5) is the further modification of the gestalt of operation of drawing 2 . A different point with the gestalt of operation shown in the gestalt and drawing 2 of the operation shown in drawing 4 (drawing 5) The liquid crystal panels 42 and 43 with which a change of the liquid crystal panels 40 and 41 without the need of specifying the transparency shaft orientation of the polarizing plate by the side of plane of incidence, and the transparency shaft orientation of the polarizing plate by the side of plane of incidence cross at right angles mutually are used, The polarizing plate which the light source uses two fluorescent lights for a change of one fluorescent light, and has the transparency shaft which is in agreement with the transparency shaft of the polarizing plate of a liquid crystal panel 42 in front of each fluorescent light, It is having the polarization light-emitting part 26 which prepared and formed the polarizing plate with the transparency shaft which is in agreement with the transparency

shaft of the polarizing plate of a liquid crystal panel 43, and the polarization light-emitting part 28.
[0034] drawing 4 -- illustration -- the light from the polarization light-emitting part 26 is divided into the transmitted light 60 and the reflected light 61 by the half mirror 30 like. Since the polarization component of the transmitted light 60 is in agreement with the transparency shaft of the polarizing plate by the side of the incidence of a liquid crystal panel 42, the parallax image pattern light 62 becomes irregular with a liquid crystal panel 42, and reflective condensing of it is carried out by Fresnel lens 50 and the reflective mirror 52 at a right eye. Since the transparency shaft of the polarizing plate by the side of the incidence of a liquid crystal panel 43 and the polarization component of the reflected light 61 cross at right angles, it is intercepted with this polarizing plate.
[0035] Moreover, as shown in drawing 5 , the light from the polarization light-emitting part 28 is divided into the transmitted light 80 and the reflected light 81 by the half mirror 30. Since the transparency shaft of the polarizing plate of a liquid crystal panel 42 and the polarization component of the transmitted light 80 cross at right angles, it is intercepted with this polarizing plate. Since the polarization component of the reflected light 81 is in agreement with the transparency shaft of the polarizing plate of a liquid crystal panel 43, the parallax image pattern light 83 becomes irregular with a liquid crystal panel 43, and reflective condensing of it is carried out by Fresnel lens 51 and the reflective mirror 53 at a left eye. For this reason, a right eye parallax image can be seen to a right eye, and a left eye parallax image can be seen to a left eye.
[0036] Here, although the polarization light-emitting parts 26 and 28 attached and formed a polarizing plate which is different in the usual light source light-emitting part, monochrome liquid crystal display which has only one polarizing plate can also be used. In this case, the screen part without an output signal emits the polarization which is in agreement with the transparency shaft of a polarizing plate, one [42], for example, the liquid crystal panel, in liquid crystal panels 42 and 43, and since the screen part with an output signal emits the polarization which is in agreement with one which will accept it in liquid crystal panels 42 and 43, for example, the transparency shaft of the polarizing plate of a liquid crystal panel 43, it can form the polarization light-emitting part of different polarization.
[0037] Drawing 6 is a modification about the arrangement method of the gestalt of operation of drawing 1 . The direction of a half mirror is changed, the liquid crystal panel of two sheets is prepared in the back and the bottom, and a fluorescent lamp 21 is formed in the bottom. The optical axis of the 1st reflective condensing means which consists of Fresnel lens 50 reflected by the half mirror 30 and a flat-surface mirror 52 similarly is inclined to right-hand side. this case -- drawing -- ** -- By making it incline to left-hand side, the optical axis of the 2nd reflective condensing means which consists of Fresnel lens 51 which passes a half mirror 30, and a flat-surface mirror 53 The parallax image pattern light 73 for left eyes which formed in the right-hand side observation zone the parallax image pattern light 72 for right eyes formed with the liquid crystal panel 40 with the liquid crystal panel 40 can be condensed in a left-hand side observation zone, respectively, and an observer can see [in / for an eye on either side / each correspondence observation zone] a stereoscopic model.
[0038] Although drawing 6 changed arrangement of reflective condensing by left-hand side into reflective condensing by the bottom the back side a back side like drawing 2 , it may be similarly changed into reflective condensing by the top, and reflective condensing by the back side and right-hand side a back side.
[0039] Drawing 7 shows the case where two or more light sources of drawing 2 are used. With the structure of drawing 2 , if an observer's optimal observation location will be moved to the right if a fluorescent lamp location is moved in the direction of the back, and a fluorescent lamp location is moved to the front, an observer's optimal observation location will be moved to the left. Therefore, if a fluorescent lamp 21 is installed in two locations, the back and this side, respectively, two observers can see a stereoscopic model to coincidence by the right and Hidari. If two or more light-emitting parts are used, it can respond to two or more observers. Similarly, the example of drawing 3 can also respond to two or more ****** for light-emitting parts, and two or more observers, and can respond to two or more ****** for polarization light-emitting part pairs, and two or more observers in the example of drawing 4 .

[0040] Furthermore, two fluorescent lights 21 are changed into the light source, for example, two LED, in which high-speed luminescence is possible about the solid image display device shown in drawing 7 , and if the liquid crystal displays 40 and 41 for a parallax image display are changed into the thing in which a high-speed display is possible, the observation zone of two pairs will be formed by time sharing by carrying out sequential luminescence of the two above-mentioned LED at a high speed. That is, the ocellus observation zone of four continuation is formed. If the parallax image pattern light corresponding to the location of those four observation zones is formed by time sharing with liquid crystal panels 40 and 41, while the head moves, the stereoscopic model of continuation can be seen. In order for the advantage of this method to form the ocellus observation zone of four continuation, it is possible at 2 time sharing, and if a liquid crystal panel has a twice [when displaying two dimensions] as many display speed as this, the animation of the rate more nearly same than four observation zones as the time of a 2-dimensional display is observable in three dimensions. Moreover, although the observation zone of two pairs is formed by time sharing here, if many light-emitting parts are made to emit light by high-speed time sharing further and the liquid crystal panel of the high speed corresponding to it generates parallax image pattern light, more parallax image observation zones can be made.

[0041] If two or more light-emitting parts (or polarization light-emitting part pair) are displayed by time sharing and the high-speed liquid crystal panel corresponding to it generates parallax image pattern light even a case [the gestalt (or gestalt of operation of drawing 4) of operation of drawing 3], since men of the same trade can understand easily, that the above-mentioned time-sharing display is possible will omit explanation of a detail.

[0042] What is necessary is here, just to attach the diffusion plate of the vertical direction near the liquid crystal panel, when using a short thing in the vertical direction although LED with the vertical direction long as the light source is illustrated. Moreover, what can offer two or more of other light-emitting parts, such as monochrome liquid crystal display of a high speed besides LED and high-speed black and white CRT, as the light source can be used. High-speed monochrome liquid crystal display can use the liquid crystal display of high speeds, such as for example, strong dielectric ********** and antiferroelectric **********.

[0043] Drawing 8 shows the gestalt of the operation which follows it and displays a parallax image on either side on an eye on either side, when an observer's location changes. The difference from the gestalt of the operation which shows the solid image display device shown in drawing 8 to drawing 1 is having formed the control section 02 which controls the light-emitting part location of monochrome liquid crystal display 23 based on the location of the observer who changed the fluorescent lamp 21 which has one light-emitting part of drawing 1 , two or more surface light sources 23, for example, monochrome liquid crystal display, which can offer a light-emitting part, and detected with an observer's location detection equipment 01, for example, a camera, and a camera 01.

[0044] Whenever it carries out like this, an observer's location is supervised with the camera 01. When an observer's location changes based on the detection result in this camera 01, the light-emitting part 20 in which reflective condensing is possible is chosen as the eye of right and left of this observer from monochrome liquid crystal displays 23 by the luminescence position control section 02, respectively, and light is made to emit. Consequently, even if an observer's location changes, incidence of the right-and-left parallax image can always be carried out to an eye on either side.

[0045] In this case, if there are two or more observers, two or more observers' location is detected, and when two or more parts of monochrome liquid crystal display 23 emit light corresponding to those locations, a stereoscopic model can be seen while two or more observers move.

[0046] Moreover, it is possible to display the three dimensional image of continuation which turns to one observer and he catches sight of, without using a high-speed liquid crystal panel, if the reflected image pattern light of a parallax image and parallax image pattern light which may be visible from the current position of the observer under migration detected in this case are formed with liquid crystal panels 40 and 41. Furthermore, if two or more light-emitting parts of monochrome liquid crystal display 23 corresponding to two or more observer locations for liquid crystal panels 40 and 41 are made to emit

light by time sharing using a high-speed liquid crystal panel and the reflected image pattern light 72 of the parallax image for right eyes and the parallax image pattern light 73 for left eyes will be formed in liquid crystal panels 40 and 41 for two or more light-emitting parts by time sharing corresponding to time-sharing luminescence as shown in drawing 9 , it is possible to display the three dimensional image of continuation which turns to two or more observers and they catch sight of.

[0047] Here, although the light source used monochrome liquid crystal display, what can offer two or more of other light-emitting parts, such as an LED array and CRT, may be used. Moreover, although the camera was used as an observer's location detection equipment, it is desirable to use the infrared light source which irradiates an observer, and an infrared camera. Moreover, it can also use, other location detection equipment, for example, magnetic position sensor etc., etc.

[0048] Also in the case of the gestalt of operation of drawing 3 , the light source is changed, two or more surface light sources 23, for example, monochrome liquid crystal display, which can offer a light-emitting part. Observer location detection equipment 01, for example, a camera, If the control section 02 which controls the light-emitting part location of monochrome liquid crystal display 23 based on the location of the observer who detected with the camera 01 is formed By choosing as the eye of right and left of this observer the part in which reflective condensing is possible from monochrome liquid crystal displays 23 by the luminescence position control section 02, respectively, and making light emit based on the detection result in a camera 01 Even if a tailing observer's location changes, incidence of the right-and-left parallax image can always be carried out to an eye on either side. The above-mentioned flattery display is possible.

[0049] The case where it deforms into two or more observer tailing of the method using polarization of drawing 4 is shown in drawing 10 . As for the liquid crystal panel 42 for right eyes, and the liquid crystal panel 43 for left eyes, the transparency shaft of the polarizing plate by the side of plane of incidence intersects perpendicularly mutually like drawing 4 . The liquid crystal display 24 which has a polarizing plate with the same transparency shaft as the transparency shaft of the polarizing plate of the liquid crystal panel 42 for right eyes only in a pack light side as the light source is used. Moreover, the control section 02 which controls the polarization luminescence location of monochrome liquid crystal display 24 based on the location of the observer who detected with observer location detection equipment 01, for example, a camera, and a camera 01 is formed. Based on the two observer location detected with the camera 01, a control device 02 deduces two observers' left eye location, chooses the part 28 by which reflective condensing of the light is carried out from the screen of a liquid crystal display 24 in a left eye location, and gives an output signal. If it does so, the partial screen 28 of a liquid crystal display 24 will emit the 2nd polarization component which is in agreement with the transparency shaft of the polarizing plate of a liquid crystal panel 43. Since this polarization can pass the polarizing plate of a liquid crystal panel 43 and the polarizing plate of a liquid crystal panel 42 cannot be passed, it becomes irregular with a liquid crystal panel 43, and the parallax image pattern light 83 for left eyes goes into each observer's left eye. All of the screen of the other liquid crystal displays 24 emit the 1st polarization, since this polarization can pass the polarizing plate of a liquid crystal panel 42 and the polarizing plate of a liquid crystal panel 43 cannot be passed, it becomes irregular with a liquid crystal panel 42, and the parallax image pattern light 62 for right eyes goes into the eye on the right of each observer, respectively. A solid image can be seen even if an observer moves. Moreover, if the parallax image corresponding to an observer's location is displayed also in this case, an observer turns and can see a three dimensional image.

[0050] In the gestalt of all operations described above, although weight mitigation is possible for it if a Fresnel lens is used, although a Fresnel lens and a plane mirror are used for a reflective condensing means, other condenser lenses may be used for it instead of a Fresnel lens. Moreover, since a lens side reflects light, it may take acid-resisting measures against a lens side. Moreover, as a reflective condensing means, the thing of two or more small concave mirror arrays elsewhere arranged for example, in the shape of a field, HOE (HOROGURA fix optical element), etc. which can be condensed can be used. Since a twin image is prevented when using two or more small concave mirrors arranged in the shape of a field, even if it sticks the reflector of two or more small concave mirrors arranged in the

shape of a field to a liquid crystal panel, and it establishes it, and it prepares inside a liquid crystal substrate, it is made. Moreover, an electrode may be processed and used for a small concave mirror.
[0051] As for the liquid crystal panel (or reflective mold liquid crystal panel) for displaying a parallax image, it is desirable to use what does not have, lateral optical diffusion means (or diffusion electrode), for example, diffusion film. Furthermore, it is more desirable for the liquid crystal panel of a side face which forms the pattern light of a parallax image and reaches an observer's eye through reflection of a half mirror to have made both sides reverse, and to prepare them. If it carries out like this, a mirror image can be acquired easily.
[0052] What has single light-emitting parts, such as a fluorescent lamp and LED, and the thing which has two or more light-emitting parts, such as monochrome display, an LED array, and black and white CRT, can be used for the light source. Moreover, it is desirable to use monochrome liquid crystal display which has only one polarizing plate by the side of a back light as the light source of the method using polarization. If it carries out like this, since polarization of the polarization component which only the screen part corresponding to one eye of an observer has with a status signal is emitted and other screen parts can emit polarization of another polarization component, it is possible to make the polarization light-emitting part which emits light in two kinds of different polarization, and it is also easy to move those locations.
[0053] Although a 2nd reflective condensing means and the 2nd optical modulation element have been arranged on left-hand side at the back side, a 1st reflective condensing means and the 1st optical modulation element as arrangement of the above-mentioned operation gestalt, so that it may be easy to explain the principle of reflective condensing In the operation gestalt of all above, if the sense of a half mirror is changed, a 1st reflective condensing means and the 1st optical modulation element, and a 1st reflective condensing means and the 1st optical modulation element can be arranged to the bottom, and the back, a top, a back side or right-hand side and a back side, respectively. Furthermore, [0054] with desirable arrangement of the viewpoint which can take a horizontal large visual field to the bottom, and the back or a top and a back side As mentioned above, although the gestalt of the operation about this invention was explained, this invention is not limited to them and deformation implementation various by within the limits of the summary of this invention is possible for it.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention relates to the compact glasses-less solid image display device which can respond to two or more observers.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[The technical problem which a background technique and invention make solution ******] Although the lenticular method and the parallax method are well learned as a solid display which does not use glasses, when resolution is low, there is a problem which cannot respond to migration of an observer easily.
[0003] as the method which can solve these problems -- "J. -- R.Moore, N.A.Dodgson, A.R.L.Travis, S.R.Lang, Time multiplexed color autostereoscopic display, and Proc. There is time-division system which is stated to SPIE.2653-01." As shown in drawing 11 , this carries out image formation of the parallax image displayed on a high speed CRT 901 with the lens 904 which approached the liquid crystal shutter array 902, and arranges Fresnel lens 903 to an image formation side. If the parallax image with which image formation is carried out with Fresnel lens 903, two or more observation zones 905 are formed in the image formation location, and the liquid crystal shutter arrays 902 differ corresponding to sequential closing motion of the liquid crystal shutter array 902 is displayed on a high speed CRT 901, an observer can see a solid image, moving using two or more observation zones 905. However, in order that this method may show the parallax image which carried out image formation with the lens 904, it is difficult to be influenced by lens distortion and to obtain a high quality stereoscopic model.
[0004] Many things which used the liquid crystal panel instead of image formation are also proposed. If this kind of solid display ****, there is an approach indicated by JP,7-159723,A. As shown in drawing 12 , using the transparency mold liquid crystal panel 911 and the 2D display 912 used as the back light light source 2 sets, this illuminates an observer's half-face with an infrared lamp 915, and photos it with the infrared camera 916. If the image which according to this approach displayed the parallax image on either side on each transparency mold liquid crystal panel 911, and carried out the reverse of that color to monochrome image of the observer photoed is displayed on each 2D display 912, a stereoscopic model can be seen while two or more observers move.
[0005] moreover, the approach indicated by JP,9-236880,A is shown in drawing 13 -- as -- the transparency mold liquid crystal panel 921, the back light light source 922, and Fresnel lens 923 -- although 2 sets and a half mirror 924 are used, since the parallax image corresponding to the location of the observer who detected with detection equipment 925 is displayed, the display of the stereoscopic vision accompanying motion parallax is possible.
[0006] although there is almost no distortion of an image in order that an observer may observe the liquid crystal panel close to a Fresnel lens, two liquid crystal panels need the respectively independent back light light source, and the volume of a system becomes large by using the two back light light sources, since it is necessary to separate and to establish the back light light source from a liquid crystal panel, and it comes to be alike of costs by these approaches highly
[0007] The solid display indicated by JP,9-149433,A is one of those set the two back light light sources to one. As shown in drawing 14 , this reflects the back light optical path of two liquid crystal panels 931 with a reflecting mirror 936, respectively, and is compounded by the half mirror 934. However, this approach cannot make the volume of a system small.
[0008] Moreover, in JP,8-160354,A, the **** thing is indicated for one back light and the liquid crystal

panel which has two kinds of one polarization pixel. This arranges two kinds of polarization pixels 951 and 961 corresponding to the polarization light sources 952 and 962 which are different in one liquid crystal panel 941, respectively, as shown in drawing 15 . If it is made to carry out incidence of the polarization light sources 952 and 962 to an eye on either side, the parallax image of the right and left displayed on the polarization pixels 951 and 961 can go into an eye on either side, respectively. Although this system is compact, in order to divide the pixel of one liquid crystal panel and to display two parallax images, the image quality of the stereoscopic model displayed will be halved.

[0009] This invention solves the conventional technical problem mentioned above, and aims at offering the solid image display device in which cheapness, high definition, and two or more observer correspondence of a compact are possible.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] The half mirror which will divide the light of the light source and this light source into the transmitted light and the reflected light if the solid image display device of this invention is caused like 1 voice, The 1st space modulation element which modulates said transmitted light and forms the pattern light of the mirror image of the 1st parallax image, this -- carry out reflective condensing of the pattern light of the mirror image of the 1st parallax image, and pass reflection of a half mirror -- with the 1st reflective condensing means led to the observation zone corresponding to one eye of an observer the 2nd space modulation element which modulates said reflected light and forms the pattern light of the 2nd parallax image -- this -- carry out reflective condensing of the pattern light of the 2nd parallax image, and pass transparency of a half mirror -- it is characterized by having the 2nd reflective condensing means led to the observation zone corresponding to the eye of an observer's another side.
[0011] When displaying a stereoscopic model based on the parallax image of the right-and-left both eyes formed of two space modulation elements according to this invention, reflective condensing of the pattern light which could irradiate two space modulation elements by the one light source by using a half mirror and two reflective condensing means, and was formed by each space modulation element can be carried out in a different observation zone. Stereoscopic vision is possible if a right-and-left eye is put on this different observation sone, respectively. The whole equipment is compact, having a space modulation element independent of an eye on either side, and being able to display a high-definition stereoscopic model, since the one light source irradiates two space modulation elements and carries out reflective condensing at an eye on either side.
[0012] Here, a space modulation element can be used as a transparency.mold liquid crystal panel, a reflective mold liquid crystal panel, etc. Moreover, as for the transparency mold liquid crystal panel and reflective mold liquid crystal panel which are used here, it is desirable not to have the means, for example, a diffusion filter, a diffuse reflection electrode, etc., for carrying out visual field expansion etc.
[0013] When a space modulation element is a transparency mold liquid crystal panel, a reflective condensing means can have a condenser lens and a flat-surface reflective mirror. It is more desirable to have prepared the condenser lens in front of the liquid crystal panel, and to prepare [it was / a flat-surface reflective mirror / close, and] it after a liquid crystal panel, in order to prevent a twin image. When a space modulation element is a reflective mold liquid crystal panel, a reflective condensing means can be used as the reflecting plate inside the back substrate of a condenser lens and a reflective mold liquid crystal panel. In this case, a reflecting plate may be a reflector.
[0014] As for a condenser lens, it is desirable that it is a Fresnel lens because of weight mitigation. In this case, it is more desirable to have carried out the processing side of a Fresnel lens outward, and to stick a non-processed side (flat surface) on a liquid crystal panel, in order to prevent surface reflection. ****** processing may be performed to a condenser lens front face.
[0015] Furthermore, you may be the array of the small concave mirror which has the same focus which is close after a liquid crystal panel as a reflective condensing means. In order to prevent a twin image, as for the reflector of a smallness concave mirror, it is desirable that it is inside the back substrate of a

liquid crystal panel. A small concave mirror may be the reflector of the reflective mold liquid crystal panel formed in a concave surface.

[0016] The light source which can offer two or more light-emitting parts, such as the light source which has single light-emitting parts, such as a fluorescent lamp, an electric bulb, and LED, as the light source or an array, 2D display, for example, an LED array, monochrome liquid crystal display, and CRT, can be used. If two or more pixels are shone when 2D display is used as the light source, it can function as one light-emitting part.

[0017] in this invention, the optical axis of said 1st reflective condensing means reflected by the half mirror and the optical axis of the 2nd reflective condensing means which passes a half mirror are not in agreement -- as -- this -- the 1st reflective condensing means and the 2nd reflective condensing means can be arranged.

[0018] For example, if the direction of the optical axis of the 1st reflective condensing means reflected by the half mirror and the direction of the optical axis of the 2nd reflective condensing means which passes a half mirror are shifted and the 1st reflective condensing means and the 2nd reflective condensing means are arranged, the light of one light-emitting part can carry out reflective condensing through a half mirror to the location which changes with the 1st reflective condensing means and 2nd reflective condensing means.

[0019] Moreover, if the location of the optical axis of the 1st reflective condensing means reflected by the half mirror and the location of the optical axis of the 2nd reflective condensing means which passes a half mirror are horizontal ****** carried out for example, and the 1st reflective condensing means and the 2nd reflective condensing means are arranged, the light of one light-emitting part can carry out reflective condensing through a half mirror to the location which changes with the 1st reflective condensing means and 2nd reflective condensing means.

[0020] If an observer puts an eye on either side on a location different the account of a top in order to carry out reflective condensing in a location which the light of one light-emitting part is modulated by parallax image pattern light on either side by two space modulation elements, and is different in these cases, respectively, a parallax image pattern light on either side will enter, respectively, and stereoscopic vision will be materialized. Since a parallax image pattern light on either side can be offered with one light-emitting part, a cheap and simple system becomes possible.

[0021] Moreover, in this invention, said light source can have the light-emitting part which emits 2nd at least one different polarization from the light-emitting part which emits 1st at least one polarization, and this polarization, said 1st space modulation element can have the polarizing plate which can pass only polarization of one side of said the 1st and 2nd polarization, and said 2nd space modulation element can have the polarizing plate which can pass only polarization of another side.

[0022] Since the light source has the polarization light-emitting part pair which emits light in at least one different polarization and two space modulation elements have the polarizing plate of a different transparency shaft, two space modulation elements modulate only the polarization from a different polarization light-emitting part which passes a different polarizing plate, respectively, and form a parallax image pattern light on either side. If a different polarization light-emitting part is justified so that it may condense through a half mirror to the eye of right and left of the observer in the location which changes with two reflective condensing means, a parallax image pattern light on either side will go into an eye on either side, and stereoscopic vision will be materialized. In this case, what is necessary is just to adjust the location of a polarization light-emitting part, in order to make the eye of two right and left condense the polarization from which two polarization light-emitting parts differ, respectively. It is an advantage for justification of a light-emitting part to be easier than justification of a reflective condensing means or a half mirror. If it considers as the light source which has two different polarization light-emitting parts, a polarizing plate which is different in each light-emitting part can be attached and used. Moreover, monochrome liquid crystal display which has only one polarizing plate, for example can be used. Although one polarization is emitted from a screen when there is no output signal, when outputting, the polarization from which only the screen of the output section differs is emitted, and two different polarization light-emitting parts are formed.

[0023] In this invention, if two or more light-emitting parts (or two or more polarization light-emitting part pairs) are made to emit light in order to form the observation zone of the stereoscopic vision of one pair with one light-emitting part (or 1 polarization light-emitting part pair), the observation zone of the stereoscopic vision of two or more pairs can be offered, and it can respond to two or more observers. Moreover, arrange two or more light-emitting parts (or two or more polarization light-emitting part pairs) in a longitudinal direction, and sequential luminescence is carried out at high speed. If the 1st space modulation element and the 2nd space modulation element modulate the mirror image of a parallax image and parallax image corresponding to the light-emitting part which emits light, respectively and high-speed formation is carried out The observation zone pair of the stereoscopic vision of continuation is formed in a longitudinal direction location by time sharing, and while an observer moves according to the after-image phenomenon of an eye, the three dimensional image of continuation can be seen.

[0024] Moreover, the detection equipment which detects an observer's location is formed, and what can offer the observation zone corresponding to an observer's location can be chosen, and can be made to emit light from two or more light-emitting parts (or two or more polarization light-emitting part pairs). Since it will be followed and a light source location will be changed even if an observer moves if it carries out like this, incidence of the mirror image pattern light of a parallax image and parallax image pattern light which are formed of two space modulation elements is always separately carried out to an observer's both eyes. The three dimentional display which follows an observation location becomes possible. Moreover, if the reflected image pattern light of the parallax image of an observation zone according to the current position of the observer who detects in this case, and parallax image pattern light are formed, it will become possible for an observer to turn and to see the three dimensional image of continuation.

[0025] Although the detection equipment which detects an observer's location can use location detection equipments, such as a camera and a magnetic position sensor, here, it is desirable to use the infrared camera which photos the infrared light source which irradiates an observer, and an observer.

[0026] As for the space modulation element by the side of reflection, in the equipment described above, it is desirable to make both sides reverse and to prepare them. If it carries out like this, and a parallax picture signal is outputted, the mirror image of the parallax image of the need can be acquired to this solid image display device.

[0027]

[Embodiment of the Invention] Drawing 1 is the explanatory view showing 1 operation gestalt of this invention. The three dimentional display equipment for displaying the parallax image of right eye correspondence in an observer's right eye 10 and the parallax image of left eye correspondence in a left eye 11, respectively is illustrated by drawing 1 . In drawing 1 , it has the fluorescent lamp 21 which has, a half mirror 30, and the light source 20, for example, a light-emitting part, the 1st space modulation element 40, for example, a liquid crystal panel, the 2nd space modulation element 41, for example, a liquid crystal panel, the 1st reflective condensing means, for example, Fresnel lens 50 and the flat-surface mirror 52, the 2nd reflective condensing means 51, for example, a Fresnel lens, and the flat-surface mirror 53.

[0028] Drawing 2 is the top view of drawing 1 . With a half mirror 30, the light of the light-emitting part 20 of a fluorescent lamp 21 is divided into the transmitted light 70 and the reflected light 71, and irradiates liquid crystal panels 40 and 41 from a transverse plane, respectively. A liquid crystal panel 40 modulates the transmitted light 70, and forms the reflected image pattern light 72 of an observer's parallax image for right eyes. A liquid crystal panel 41 modulates the reflected light 71, and forms an observer's parallax image pattern light 73 for left eyes. With this operation gestalt, it is close behind liquid crystal panels 40 and 41, the flat-surface reflective mirrors 52 and 53 are formed, respectively, and Fresnel lenses 50 and 51 are formed in front, respectively.

[0029] The optical axis 500 (white line) of the 1st reflective condensing means which consists of Fresnel lens 50 reflected by the half mirror 30 and a flat-surface mirror 52 is inclined to right-hand side. By making it incline to left-hand side, the optical axis 510 (white line) of the 2nd reflective condensing

means which consists of Fresnel lens 51 which passes a half mirror 30, and a flat-surface mirror 53 The parallax image pattern light 73 for left eyes which formed in the right-hand side observation zone the parallax image pattern light 72 for right eyes formed with the liquid crystal panel 40 with the liquid crystal panel 40 can be condensed in a left-hand side observation zone, respectively, and an observer can see [in / for an eye on either side / each correspondence observation zone] a stereoscopic model.
[0030] In this example, although the Fresnel lens, the liquid crystal panel, and the flat-surface reflective mirror are parallel, they do not surely need to be parallel. Even when only a flat-surface reflective mirror inclines, the optical axis of a reflective condensing means inclines. However, it is more desirable to have been parallel and close and to prepare a liquid crystal panel in a flat-surface reflective mirror for twin image prevention. Moreover, although the inclination direction of the optical axis of the 1st and 2nd reflective condensing means is illustrated, the inclination direction of an optical axis is not restricted to this, either. For example, the optical axis 500 (white line) of the 1st reflective condensing means which consists of Fresnel lens 50 reflected by the half mirror 30 and a flat-surface mirror 52 is inclined to left-hand side. When making the optical axis 510 (white line) of the 2nd reflective condensing means which consists of Fresnel lens 51 which passes a half mirror 30, and a flat-surface mirror 53 incline to right-hand side, If a liquid crystal panel 40 forms the reflected image pattern light 72 of an observer's parallax image for left eyes and a liquid crystal panel 41 forms an observer's parallax image pattern light for right eyes. Stereoscopic vision is possible similarly.
[0031] Drawing 3 is the modification of the gestalt of operation of drawing 2 . The difference from the gestalt of operation and the gestalt of operation of drawing 2 which are shown in drawing 3 is having shifted the not a direction but location of an optical axis. The location of the optical axis 500 (white line) of the 1st reflective condensing means which consists of Fresnel lens 50 reflected by the half mirror 30 and a flat-surface mirror 52 is located in right-hand side. When making it the location of the optical axis 510 (white line) of the 2nd reflective condensing means which consists of Fresnel lens 51 which passes a half mirror 30, and a flat-surface mirror 53 located in left-hand side The parallax image pattern light 73 for left eyes which formed in the right-hand side observation zone the parallax image pattern light 72 for right eyes formed with the liquid crystal panel 40 with the liquid crystal panel 40 can be condensed in a left-hand side observation zone, respectively, and an observer can see [in / for an eye on either side / each correspondence observation zone] a stereoscopic model.
[0032] In this example, although the relative position of the optical axis of the 1st and 2nd reflective condensing means is illustrated, the relative position of an optical axis is not restricted to this. For example, the optical axis 500 (white line) of the 1st reflective condensing means which consists of Fresnel lens 50 reflected by the half mirror 30 and a flat-surface mirror 52 is located in the left. Even if it makes it located in right-hand side, the optical axis 510 (white line) of the 2nd reflective condensing means which consists of Fresnel lens 51 which passes a half mirror 30, and a flat-surface mirror 53 If a liquid crystal panel 40 forms the reflected image pattern light 72 of an observer's parallax image for left eyes and a liquid crystal panel 41 forms an observer's parallax image pattern light for right eyes. Stereoscopic vision is possible similarly.
[0033] Drawing 4 (drawing 5) is the further modification of the gestalt of operation of drawing 2 . A different point with the gestalt of operation shown in the gestalt and drawing 2 of the operation shown in drawing 4 (drawing 5) The liquid crystal panels 42 and 43 with which a change of the liquid crystal panels 40 and 41 without the need of specifying the transparency shaft orientation of the polarizing plate by the side of plane of incidence, and the transparency shaft orientation of the polarizing plate by the side of plane of incidence cross at right angles mutually are used, The polarizing plate which the light source uses two fluorescent lights for a change of one fluorescent light, and has the transparency shaft which is in agreement with the transparency shaft of the polarizing plate of a liquid crystal panel 42 in front of each fluorescent light, It is having the polarization light-emitting part 26 which prepared and formed the polarizing plate with the transparency shaft which is in agreement with the transparency shaft of the polarizing plate of a liquid crystal panel 43, and the polarization light-emitting part 28.
[0034] drawing 4 -- illustration -- the light from the polarization light-emitting part 26 is divided into the transmitted light 60 and the reflected light 61 by the half mirror 30 like. Since the polarization

component of the transmitted light 60 is in agreement with the transparency shaft of the polarizing plate by the side of the incidence of a liquid crystal panel 42, the parallax image pattern light 62 becomes irregular with a liquid crystal panel 42, and reflective condensing of it is carried out by Fresnel lens 50 and the reflective mirror 52 at a right eye. Since the transparency shaft of the polarizing plate by the side of the incidence of a liquid crystal panel 43 and the polarization component of the reflected light 61 cross at right angles, it is intercepted with this polarizing plate.

[0035] Moreover, as shown in drawing 5 , the light from the polarization light-emitting part 28 is divided into the transmitted light 80 and the reflected light 81 by the half mirror 30. Since the transparency shaft of the polarizing plate of a liquid crystal panel 42 and the polarization component of the transmitted light 80 cross at right angles, it is intercepted with this polarizing plate. Since the polarization component of the reflected light 81 is in agreement with the transparency shaft of the polarizing plate of a liquid crystal panel 43, the parallax image pattern light 83 becomes irregular with a liquid crystal panel 43, and reflective condensing of it is carried out by Fresnel lens 51 and the reflective mirror 53 at a left eye. For this reason, a right eye parallax image can be seen to a right eye, and a left eye parallax image can be seen to a left eye.

[0036] Here, although the polarization light-emitting parts 26 and 28 attached and formed a polarizing plate which is different in the usual light source light-emitting part, monochrome liquid crystal display which has only one polarizing plate can also be used. In this case, the screen part without an output signal emits the polarization which is in agreement with the transparency shaft of a polarizing plate, one [42], for example, the liquid crystal panel, in liquid crystal panels 42 and 43, and since the screen part with an output signal emits the polarization which is in agreement with one which will accept it in liquid crystal panels 42 and 43, for example, the transparency shaft of the polarizing plate of a liquid crystal panel 43, it can form the polarization light-emitting part of different polarization.

[0037] Drawing 6 is a modification about the arrangement method of the gestalt of operation of drawing 1 . The direction of a half mirror is changed, the liquid crystal panel of two sheets is prepared in the back and the bottom, and a fluorescent lamp 21 is formed in the bottom. The optical axis of the 1st reflective condensing means which consists of Fresnel lens 50 reflected by the half mirror 30 and a flat-surface mirror 52 similarly is inclined to right-hand side. this case -- drawing -- ** -- By making it incline to left-hand side, the optical axis of the 2nd reflective condensing means which consists of Fresnel lens 51 which passes a half mirror 30, and a flat-surface mirror 53 The parallax image pattern light 73 for left eyes which formed in the right-hand side observation zone the parallax image pattern light 72 for right eyes formed with the liquid crystal panel 40 with the liquid crystal panel 40 can be condensed in a left-hand side observation zone, respectively, and an observer can see [in / for an eye on either side / each correspondence observation zone] a stereoscopic model.

[0038] Although drawing 6 changed arrangement of reflective condensing by left-hand side into reflective condensing by the bottom the back side a back side like drawing 2 , it may be similarly changed into reflective condensing by the top, and reflective condensing by the back side and right-hand side a back side.

[0039] Drawing 7 shows the case where two or more light sources of drawing 2 are used. With the structure of drawing 2 , if an observer's optimal observation location will be moved to the right if a fluorescent lamp location is moved in the direction of the back, and a fluorescent lamp location is moved to the front, an observer's optimal observation location will be moved to the left. Therefore, if a fluorescent lamp 21 is installed in two locations, the back and this side, respectively, two observers can see a stereoscopic model to coincidence by the right and Hidari. If two or more light-emitting parts are used, it can respond to two or more observers. Similarly, the example of drawing 3 can also respond to two or more ****** for light-emitting parts, and two or more observers, and can respond to two or more ****** for polarization light-emitting part pairs, and two or more observers in the example of drawing 4 .

[0040] Furthermore, two fluorescent lights 21 are changed into the light source, for example, two LED, in which high-speed luminescence is possible about the solid image display device shown in drawing 7 , and if the liquid crystal displays 40 and 41 for a parallax image display are changed into the thing in

which a high-speed display is possible, the observation zone of two pairs will be formed by time sharing by carrying out sequential luminescence of the two above-mentioned LED at a high speed. That is, the ocellus observation zone of four continuation is formed. If the parallax image pattern light corresponding to the location of those four observation zones is formed by time sharing with liquid crystal panels 40 and 41, while the head moves, the stereoscopic model of continuation can be seen. In order for the advantage of this method to form the ocellus observation zone of four continuation, it is possible at 2 time sharing, and if a liquid crystal panel has a twice [when displaying two dimensions] as many display speed as this, the animation of the rate more nearly same than four observation zones as the time of a 2-dimensional display is observable in three dimensions. Moreover, although the observation zone of two pairs is formed by time sharing here, if many light-emitting parts are made to emit light by high-speed time sharing further and the liquid crystal panel of the high speed corresponding to it generates parallax image pattern light, more parallax image observation zones can be made.

[0041] If two or more light-emitting parts (or polarization light-emitting part pair) are displayed by time sharing and the high-speed liquid crystal panel corresponding to it generates parallax image pattern light even a case [the gestalt (or gestalt of operation of drawing 4) of operation of drawing 3], since men of the same trade can understand easily, that the above-mentioned time-sharing display is possible will omit explanation of a detail.

[0042] What is necessary is here, just to attach the diffusion plate of the vertical direction near the liquid crystal panel, when using a short thing in the vertical direction although LED with the vertical direction long as the light source is illustrated. Moreover, what can offer two or more of other light-emitting parts, such as monochrome liquid crystal display of a high speed besides LED and high-speed black and white CRT, as the light source can be used. High-speed monochrome liquid crystal display can use the liquid crystal display of high speeds, such as for example, strong dielectric ********** and antiferroelectric **********.

[0043] Drawing 8 shows the gestalt of the operation which follows it and displays a parallax image on either side on an eye on either side, when an observer's location changes. The difference from the gestalt of the operation which shows the solid image display device shown in drawing 8 to drawing 1 is having formed the control section 02 which controls the light-emitting part location of monochrome liquid crystal display 23 based on the location of the observer who changed the fluorescent lamp 21 which has one light-emitting part of drawing 1 , two or more surface light sources 23, for example, monochrome liquid crystal display, which can offer a light-emitting part, and detected with an observer's location detection equipment 01, for example, a camera, and a camera 01.

[0044] Whenever it carries out like this, an observer's location is supervised with the camera 01. When an observer's location changes based on the detection result in this camera 01, the light-emitting part 20 in which reflective condensing is possible is chosen as the eye of right and left of this observer from monochrome liquid crystal displays 23 by the luminescence position control section 02, respectively, and light is made to emit. Consequently, even if an observer's location changes, incidence of the right-and-left parallax image can always be carried out to an eye on either side.

[0045] In this case, if there are two or more observers, two or more observers' location is detected, and when two or more parts of monochrome liquid crystal display 23 emit light corresponding to those locations, a stereoscopic model can be seen while two or more observers move.

[0046] Moreover, it is possible to display the three dimensional image of continuation which turns to one observer and he catches sight of, without using a high-speed liquid crystal panel, if the reflected image pattern light of a parallax image and parallax image pattern light which may be visible from the current position of the observer under migration detected in this case are formed with liquid crystal panels 40 and 41. Furthermore, if two or more light-emitting parts of monochrome liquid crystal display 23 corresponding to two or more observer locations for liquid crystal panels 40 and 41 are made to emit light by time sharing using a high-speed liquid crystal panel and the reflected image pattern light 72 of the parallax image for right eyes and the parallax image pattern light 73 for left eyes will be formed in liquid crystal panels 40 and 41 for two or more light-emitting parts by time sharing corresponding to

time-sharing luminescence as shown in drawing 9 , it is possible to display the three dimensional image of continuation which turns to two or more observers and they catch sight of.
[0047] Here, although the light source used monochrome liquid crystal display, what can offer two or more of other light-emitting parts, such as an LED array and CRT, may be used. Moreover, although the camera was used as an observer's location detection equipment, it is desirable to use the infrared light source which irradiates an observer, and an infrared camera. Moreover, it can also use, other location detection equipment, for example, magnetic position sensor etc., etc.
[0048] Also in the case of the gestalt of operation of drawing 3 , the light source is changed, two or more surface light sources 23, for example, monochrome liquid crystal display, which can offer a light-emitting part. Observer location detection equipment 01, for example, a camera, If the control section 02 which controls the light-emitting part location of monochrome liquid crystal display 23 based on the location of the observer who detected with the camera 01 is formed By choosing as the eye of right and left of this observer the part in which reflective condensing is possible from monochrome liquid crystal displays 23 by the luminescence position control section 02, respectively, and making light emit based on the detection result in a camera 01 Even if a tailing observer's location changes, incidence of the right-and-left parallax image can always be carried out to an eye on either side. The above-mentioned flattery display is possible.
[0049] The case where it deforms into two or more observer tailing of the method using polarization of drawing 4 is shown in drawing 10 . As for the liquid crystal panel 42 for right eyes, and the liquid crystal panel 43 for left eyes, the transparency shaft of the polarizing plate by the side of plane of incidence intersects perpendicularly mutually like drawing 4 . The liquid crystal display 24 which has a polarizing plate with the same transparency shaft as the transparency shaft of the polarizing plate of the liquid crystal panel 42 for right eyes only in a pack light side as the light source is used. Moreover, the control section 02 which controls the polarization luminescence location of monochrome liquid crystal display 24 based on the location of the observer who detected with observer location detection equipment 01, for example, a camera, and a camera 01 is formed. Based on the two observer location detected with the camera 01, a control device 02 deduces two observers' left eye location, chooses the part 28 by which reflective condensing of the light is carried out from the screen of a liquid crystal display 24 in a left eye location, and gives an output signal. If it does so, the partial screen 28 of a liquid crystal display 24 will emit the 2nd polarization component which is in agreement with the transparency shaft of the polarizing plate of a liquid crystal panel 43. Since this polarization can pass the polarizing plate of a liquid crystal panel 43 and the polarizing plate of a liquid crystal panel 42 cannot be passed, it becomes irregular with a liquid crystal panel 43, and the parallax image pattern light 83 for left eyes goes into each observer's left eye. All of the screen of the other liquid crystal displays 24 emit the 1st polarization, since this polarization can pass the polarizing plate of a liquid crystal panel 42 and the polarizing plate of a liquid crystal panel 43 cannot be passed, it becomes irregular with a liquid crystal panel 42, and the parallax image pattern light 62 for right eyes goes into the eye on the right of each observer, respectively. A solid image can be seen even if an observer moves. Moreover, if the parallax image corresponding to an observer's location is displayed also in this case, an observer turns and can see a three dimensional image.
[0050] In the gestalt of all operations described above, although weight mitigation is possible for it if a Fresnel lens is used, although a Fresnel lens and a plane mirror are used for a reflective condensing means, other condenser lenses may be used for it instead of a Fresnel lens. Moreover, since a lens side reflects light, it may take acid-resisting measures against a lens side. Moreover, as a reflective condensing means, the thing of two or more small concave mirror arrays elsewhere arranged for example, in the shape of a field, HOE (HOROGURA fix optical element), etc. which can be condensed can be used. Since a twin image is prevented when using two or more small concave mirrors arranged in the shape of a field, even if it sticks the reflector of two or more small concave mirrors arranged in the shape of a field to a liquid crystal panel, and it establishes it, and it prepares inside a liquid crystal substrate, it is made. Moreover, an electrode may be processed and used for a small concave mirror.
[0051] As for the liquid crystal panel (or reflective mold liquid crystal panel) for displaying a parallax

image, it is desirable to use what does not have, lateral optical diffusion means (or diffusion electrode), for example, diffusion film. Furthermore, it is more desirable for the liquid crystal panel of a side face which forms the pattern light of a parallax image and reaches an observer's eye through reflection of a half mirror to have made both sides reverse, and to prepare them. If it carries out like this, a mirror image can be acquired easily.

[0052] What has single light-emitting parts, such as a fluorescent lamp and LED, and the thing which has two or more light-emitting parts, such as monochrome display, an LED array, and black and white CRT, can be used for the light source. Moreover, it is desirable to use monochrome liquid crystal display which has only one polarizing plate by the side of a back light as the light source of the method using polarization. If it carries out like this, since polarization of the polarization component which only the screen part corresponding to one eye of an observer has with a status signal is emitted and other screen parts can emit polarization of another polarization component, it is possible to make the polarization light-emitting part which emits light in two kinds of different polarization, and it is also easy to move those locations.

[0053] Although a 2nd reflective condensing means and the 2nd optical modulation element have been arranged on left-hand side at the back side, a 1st reflective condensing means and the 1st optical modulation element as arrangement of the above-mentioned operation gestalt, so that it may be easy to explain the principle of reflective condensing In the operation gestalt of all above, if the sense of a half mirror is changed, a 1st reflective condensing means and the 1st optical modulation element, and a 1st reflective condensing means and the 1st optical modulation element can be arranged to the bottom, and the back, a top, a back side or right-hand side and a back side, respectively. Furthermore, [0054] with desirable arrangement of the viewpoint which can take a horizontal large visual field to the bottom, and the back or a top and a back side As mentioned above, although the gestalt of the operation about this invention was explained, this invention is not limited to them and deformation implementation various by within the limits of the summary of this invention is possible for it.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The schematic diagram of the gestalt of 1 operation of this invention
[Drawing 2] The top view explaining the reflective condensing method of the gestalt of operation of drawing 1
[Drawing 3] The modification which changed the reflective condensing method of the gestalt of operation of drawing 2
[Drawing 4] Other modifications which changed the reflective condensing method of the gestalt of operation of drawing 2
[Drawing 5] Other modifications which changed the reflective condensing method of the gestalt of operation of drawing 2
[Drawing 6] The modification which changed arrangement of the gestalt of operation of drawing 1
[Drawing 7] The modification which changed the gestalt of operation of drawing 2 into two or more observer correspondence
[Drawing 8] The modification which changed the gestalt of operation of drawing 2 into the trailing type
[Drawing 9] The modification which changed the gestalt of operation of drawing 2 into two or more observer trailing type
[Drawing 10] The modification which changed the gestalt of operation of drawing 4 into two or more observer trailing type
[Drawing 11] The principle Fig. of the time-division system which is the conventional method
[Drawing 12] The principle Fig. of the back light method which is the conventional method
[Drawing 13] The back light method accompanying the motion parallax which is the conventional method which can be displayed
[Drawing 14] The principle Fig. of the single back light light source method which is the conventional method
[Drawing 15] The principle Fig. of the method using the polarization which is the conventional method
[Description of Notations]
01 Camera Used as Observer's Location Detection Equipment
02 Luminescence Positional Controller
10 Observer's Right Eye
11 Observer's Left Eye
20 Light-emitting Part of Light Source
21 Fluorescent Lamp Which was with Light Source and was Used
23 Monochrome Liquid Crystal Display Used as the Light Source
24 Monochrome Liquid Crystal Display Which Has Only One Polarizing Plate Used as the Polarization Light Source
26 Polarization Light-emitting Part Which Emits 1st Polarization
28 Polarization Light-emitting Part Which Emits 2nd Polarization
30 Half Mirror

40 Liquid Crystal Panel for Right Eyes Used as a 1st Space Modulation Element
41 Liquid Crystal Panel for Left Eyes Used as a 2nd Space Modulation Element
42 Liquid Crystal Panel for Right Eyes in which Transparency Shaft of Plane-of-Incidence Polarizing Plate Carries Out Perpendicular to that of Liquid Crystal Panel for Left Eyes
43 Liquid Crystal Panel for Left Eyes in which Transparency Shaft of Plane-of-Incidence Polarizing Plate Carries Out Perpendicular to that of Liquid Crystal Panel for Right Eyes
50 Fresnel Lens for Right Eyes Used Also as a Condensing Means of 1st Reflective Condensing Means
51 Fresnel Lens for Left Eyes Used Also as a Condensing Means of 2nd Reflective Condensing Means
52 Reflective Mirror for Right Eyes Used Also as a Reflective Means of 1st Reflective Condensing Means
53 Reflective Mirror for Left Eyes Used Also as a Reflective Means of 2nd Reflective Condensing Means
500 Optical Axis of 1st Reflective Condensing Means
510 Optical Axis of 2nd Reflective Condensing Means
70 Transmitted Light Which Penetrates Half Mirror
71 Reflected Light Reflected by Half Mirror
72 Pattern Light for Right Eyes
73 Pattern Light for Left Eyes
60 Transmitted Light of 1st Polarization Light-emitting Part Which Penetrates Half Mirror
61 Reflected Light of 1st Polarization Light-emitting Part Reflected by Half Mirror
62 Pattern Light of 1st Polarization
80 Transmitted Light of 2nd Polarization Light-emitting Part Which Penetrates Half Mirror
81 Reflected Light of 2nd Polarization Light-emitting Part Reflected by Half Mirror
83 Pattern Light of 2nd Polarization
901 High Speed CRT
902 Liquid Crystal Shutter Array
903 913, 923, 933 Fresnel Lens
904 Lens
905 Observation Zone
911, 921, 931 Transparency mold liquid crystal panel
912 2D Display
914, 924, 934 Half mirror
915 Infrared Lamp
916 Infrared Camera
922,932 Back light
925 Detection Equipment
936 Reflecting Mirror
941 Liquid Crystal Panel Which Has Two Kinds of Polarization Pixels
951 961 Polarization pixel
952 962 Polarization light source

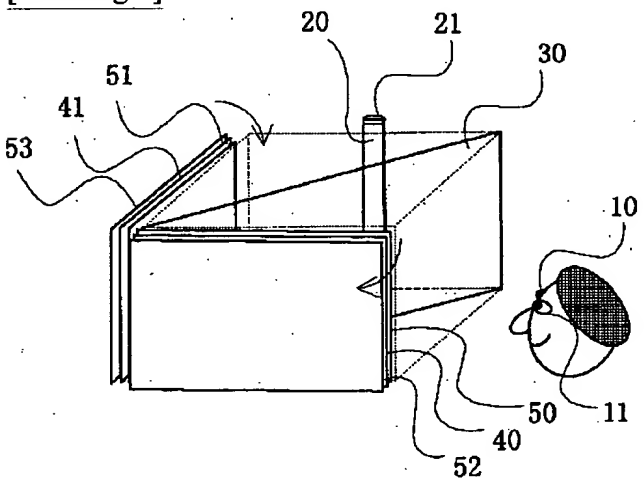
[Translation done.]

* NOTICES *

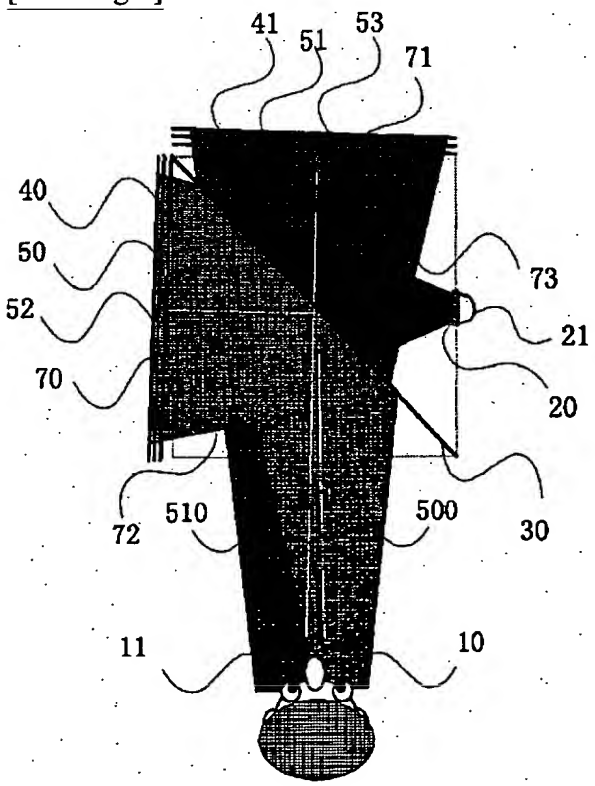
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

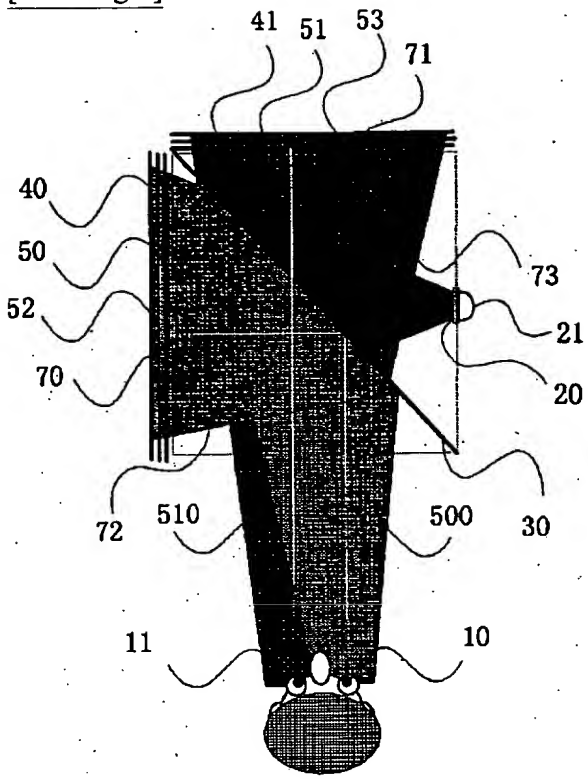
[Drawing 1]



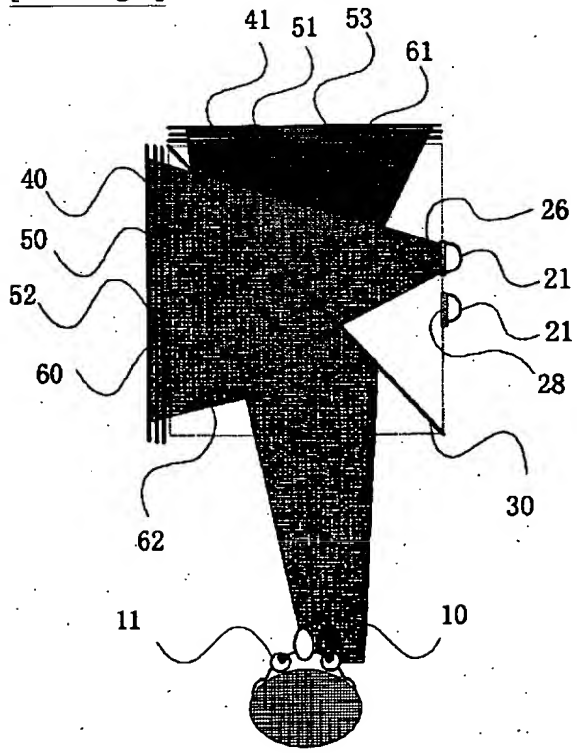
[Drawing 2]



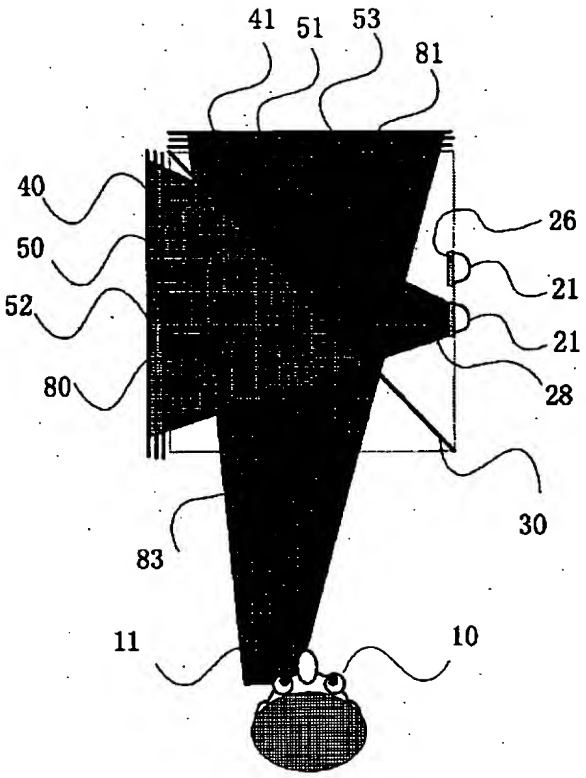
[Drawing 3]



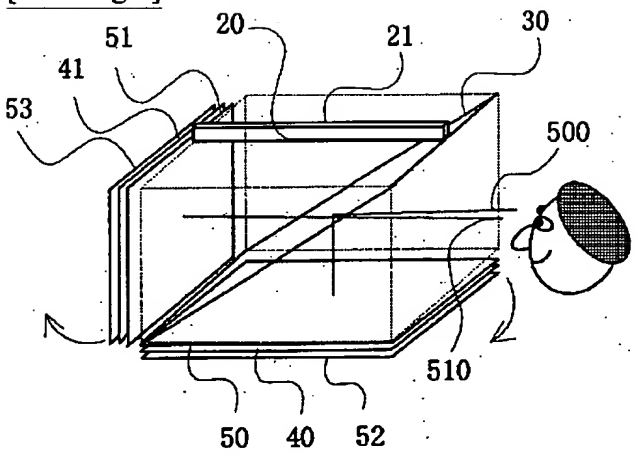
[Drawing 4]



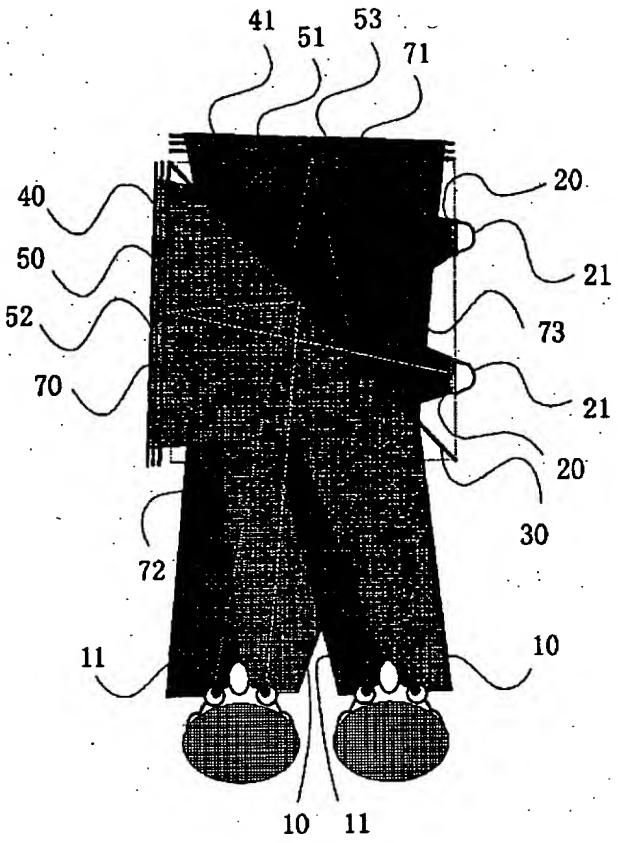
[Drawing 5]



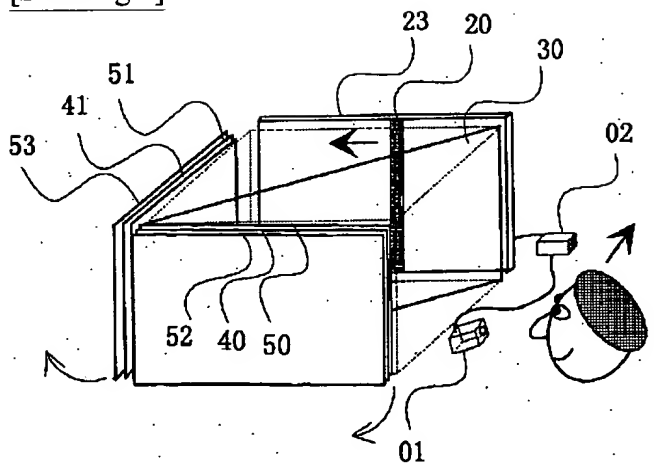
[Drawing 6]



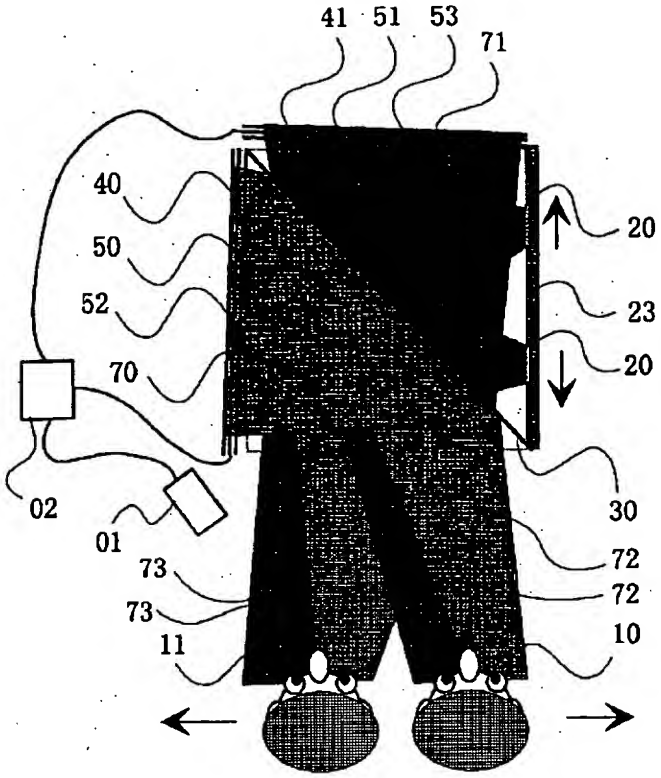
[Drawing 7]



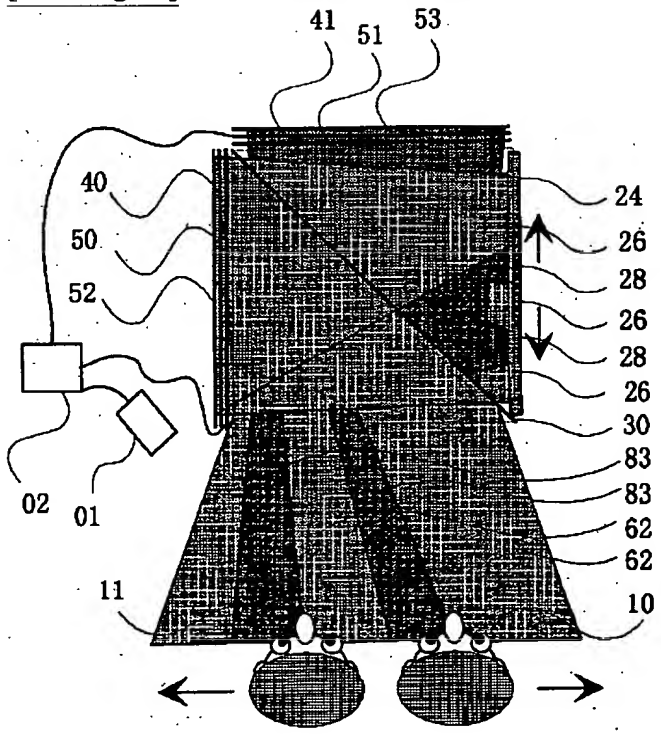
[Drawing 8]



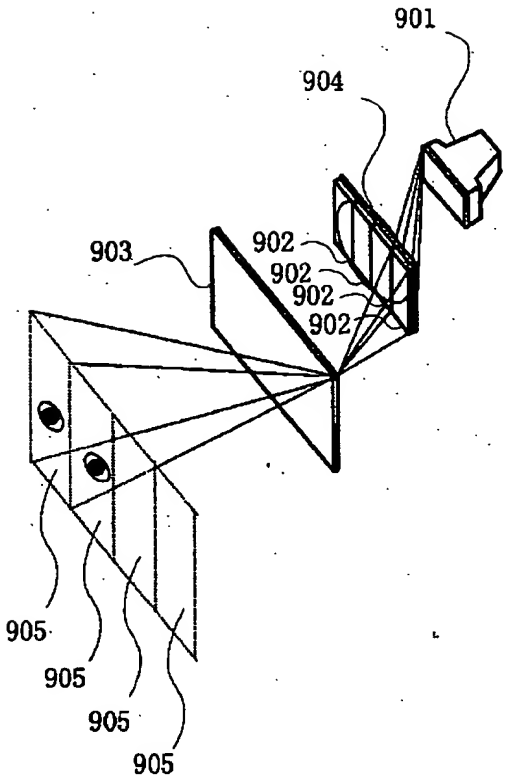
[Drawing 9]



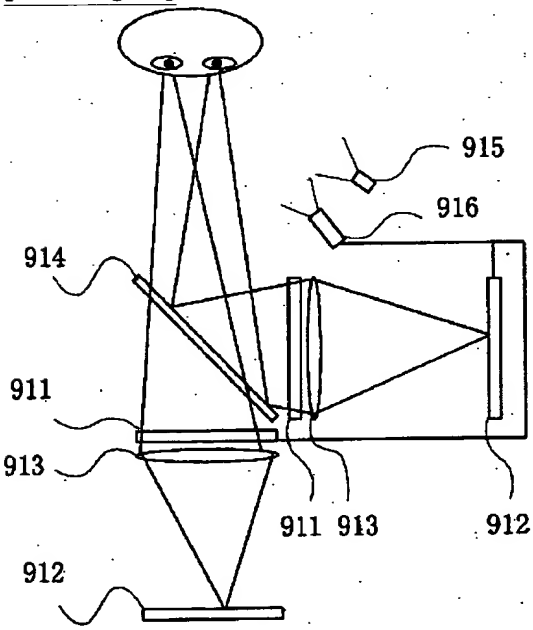
[Drawing 10]



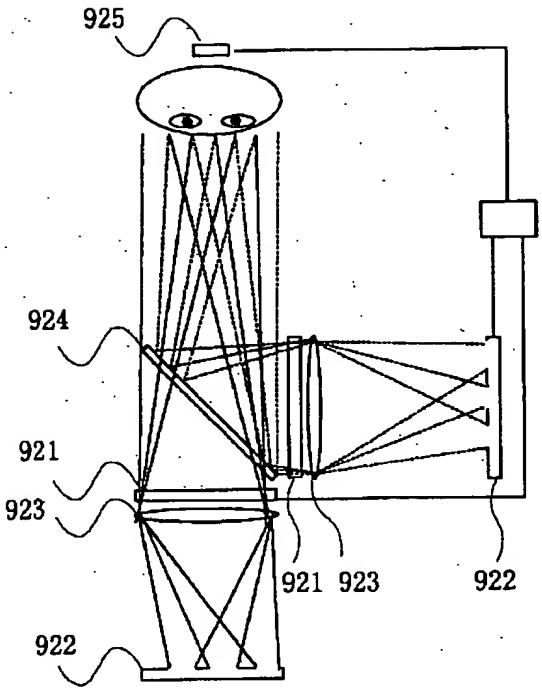
[Drawing 11]



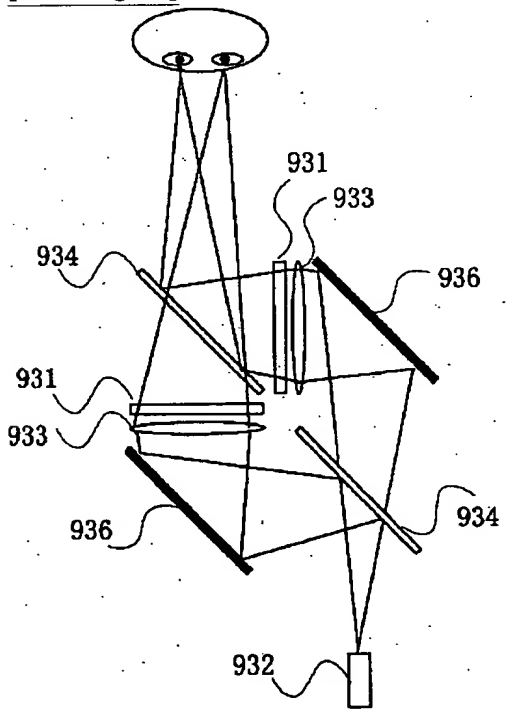
[Drawing 12]



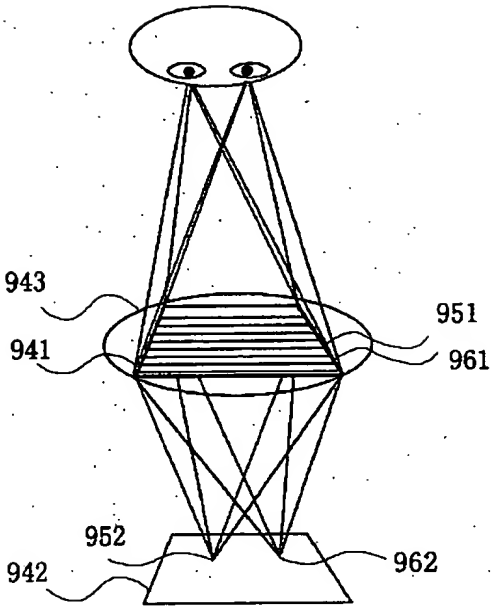
[Drawing 13]



[Drawing 14]



[Drawing 15]



[Translation done.]